

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY


(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 21 DEC 2005

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Applicant's or agent's file reference 15819 MdH		<b>FOR FURTHER ACTION</b>		See Form PCT/IPEA/416
International application No. PCT/GB2005/000812		International filing date (day/month/year) 03.03.2005		Priority date (day/month/year) 06.03.2004
International Patent Classification (IPC) or national classification and IPC C01F7/47, B01J19/10				
Applicant ACCENTUS PLC et al.				
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 1 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>				
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>				
Date of submission of the demand  23.11.2005		Date of completion of this report  19.12.2005		
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized Officer  Besana, S  Telephone No. +49 89 2399-8002		



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**Box No. I Basis of the report**

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1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

1-10 as originally filed

**Claims, Numbers**

1-5, 6(part), 11(part), 12 as originally filed  
6(part), 7-10, 11(part) received on 23.11.2005 with letter of 21.11.2005

**Drawings, Sheets**

1/2, 2/2 as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing *(specify)*:
  - ☐ any table(s) related to sequence listing *(specify)*:
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing *(specify)*:
  - ☐ any table(s) related to sequence listing *(specify)*:

\* If item 4 applies, some or all of these sheets may be marked "superseded."

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-8
	No: Claims	9-12
Inventive step (IS)	Yes: Claims	1-8
	No: Claims	9-12
Industrial applicability (IA)	Yes: Claims	1-12
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

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**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

1. Reference is made to the following documents:  
D1: WO 03/101578 A (ACCENTUS PLC; MCCAUSLAND, LINDA, JANE; PERKINS, JOHN, PATRICK) 11 December 2003 (2003-12-11)  
D2: WO 00/35579 A (AEA TECHNOLOGY PLC; PERKINS, JOHN, PATRICK) 22 June 2000 (2000-06-22)  
D3: WO 02/089942 A (ACCENTUS PLC; BOWE, MICHAEL, JOSEPH; MCCAUSLAND, LINDA, JANE; STAIRMAN) 14 November 2002 (2002-11-14)  
D4: GB-A-2 306 202 (BRITISH NUCLEAR FUELS PLC) 30 April 1997 (1997-04-30)  
D5: US-A-4 275 042 (LEVER ET AL) 23 June 1981 (1981-06-23)
2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 9 is not new in the sense of Article 33(2) PCT.

The documents D1-D4, when considered separately, disclose (see the relevant passages cited in the search report) an apparatus comprising means to make a stream of a supersaturated solution, means to subject the solution to ultrasonic irradiation and means to remove the resultant crystals.

In this respect, the attention of the applicant is drawn to the fact that the feature "**A Bayer liquor treatment apparatus for removing sodium oxalate from a Bayer liquor**" does not limit the scope of the apparatus claim: the claimed apparatus is not especially adapted in order to treat a Bayer process stream and, hence, is not distinguishable from the apparatus as described in the documents D1-D4.

The apparatus as disclosed in the prior art can be used to treat a Bayer process stream.

Hence, the documents D1-D4, when considered separately, are novelty destroying for the subject-matter of claim 9.

3. Dependent claims 10-12 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty (Article 33(2) PCT) in that the additional features are already

known from the cited documents.

4. Document D5, which is considered to represent the most relevant state of the art for the subject-matter of claim 1, discloses (cf. col.2 l.42-col.3 l.4; col.4 l.2-20; col.4 l.47-col.5 l.12) a method for removing sodium oxalate from Bayer process liquor, wherein the liquor is supersaturated and cation sequestrants are added to the liquor in order to interact with the humic material to give an insoluble product and to stimulate precipitation of sodium oxalate. The precipitation of sodium oxalate can be accelerated by adding seed crystals.

The subject-matter of independent claim 1 differs from the disclosure of D5 in that precipitation of sodium oxalate is achieved by irradiating the supersaturated liquor with ultrasound.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may therefore be regarded as a method of efficient removal of sodium oxalate from a Bayer liquor, satisfactory crystallisation and crystal growth of the sodium oxalate in a very impure and contaminated solution containing organic compounds; the resulting crystals would be easier to separate from the remaining liquid.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

Document D1 (see the relevant passages cited in the search report) is concerned with a method for inducing crystallisation of pure materials suitable for use in pharmaceuticals. This documents is therefore solving a different problem. There is hence no hint for the skilled person to apply the teaching of D1 to the process known from D5 to solve the problem posed.

The applicant has furthermore demonstrated that in a Bayer plant incorporating an oxalate removal process as shown in figure 1, but without the application of ultrasound, the sodium oxalate concantration is reduced to 2.1-2.4g/l, whereas with

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application of ultrasound the sodium oxalate concentration is reduced to 1.77-1.87 g/l or even to 1.42 g/l (at a lower temperature).

5. Claims 2-8 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

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evaporation so that it becomes supersaturated with sodium oxalate.

7. A method as claimed in any one of the preceding  
5 claims wherein the crystals resulting from ultrasonic irradiation are contacted with liquor that is supersaturated with sodium oxalate so the crystals grow, before removing resultant crystals.

10 8. A method as claimed in any one of the preceding claims wherein a stream of liquid that is supersaturated in sodium oxalate and which contains crystals of sodium oxalate is subjected to ultrasonic irradiation, to cause more crystal growth.

15 9. A Bayer liquor treatment apparatus for removing sodium oxalate from a Bayer liquor, the apparatus comprising means to make a stream of the liquor supersaturated with sodium oxalate, means to subject  
20 supersaturated liquor to ultrasonic irradiation, and means to remove the resultant crystals.

10. An apparatus as claimed in claim 9 wherein the ultrasonic irradiation means comprises a duct with a  
25 multiplicity of ultrasonic transducers attached to a wall of the duct in an array of separate transducers extending both circumferentially and longitudinally, each transducer being connected to a signal generator arranged such that the transducer radiates no more than  $3 \text{ W/cm}^2$ ,  
30 the number and the proximity of the transducers being sufficient that the power dissipation within the vessel in use is between 25 and 150 W/litre.

11. An apparatus as claimed in claim 9 or claim 10 also  
35 comprising a vessel in which supersaturated liquor is combined with the liquor that has been subjected to